

SUBCHAPTER 6. PERMISSIBLE DOSE RATES, RADIATION LEVELS AND CONCENTRATIONS

7:28-6.1 Exposure of individuals in controlled areas

(a) Except as provided in subsection (b) of this Section, no individual in a controlled area shall receive in any period of one calendar quarter a dose in excess of the following specified limits:

1. Whole body; head and trunk; active blood-forming organs; lens of eyes; or gonads 1 $\frac{1}{4}$ Rems;
2. Hands and forearms; feet and ankles 18 $\frac{3}{4}$ Rems;
3. Skin of whole body 7 $\frac{1}{2}$ Rems.

Note: Doses received by human patients from intentional exposure to radiation for the purpose of diagnosis or therapy shall be excluded.

(b) An individual in a controlled area may receive a dose to the whole body greater than that permitted under subsection (a) of this Section, provided:

1. During any calendar quarter the dose to the whole body shall not exceed three rems;
2. The dose to the whole body, when added to the accumulated occupational dose to the whole body, shall not exceed five (N-18) rems where "N" equals the individual's age in years at his last birthday; and
3. The owner has determined the individual's accumulated occupational dose to the whole body on Form BRP-27, or on a clear and legible record containing all the information required in that form; and has otherwise complied with the requirements of subsection (c) of this Section. As used in this subsection "dose to the whole body" includes any dose to the whole body, gonads, active blood-forming organs, head and trunk, or lens of eye; and
4. Doses received by human patients from intentional exposure to radiation for the purpose of diagnosis or therapy shall be excluded, in the computations set forth in paragraphs 1 and 2 of this subsection.

(c) The following requirements must be satisfied by owners who propose, pursuant to subsection (b) of this Section to permit individuals in a controlled area to receive exposure to radiation in excess of the limits specified in subsection (a) of this Section:

1. Before permitting any individual in a controlled area to receive exposure to radiation in excess of the limits specified in subsection (a) of this Section each owner shall:

- i. Obtain a certificate on Form BRP-27, or on a clear and legible record containing all the information required in that form, signed by the individual showing each period of time after the individual attained the age of 18 in which the individual received, or may have received, an occupational dose of radiation; and
 - ii. Calculate on Form BRP-27, in accordance with the instructions, or on a clear and legible record containing all the information required in that form, the previously accumulated occupational dose received by the individual and the additional dose allowed for that individual under subsection (b) of this Section.
2. In the preparation of Form BRP-27, or on a clear and legible record containing all information required in that form, the owner shall make a reasonable effort to obtain reports of the individual's previously accumulated occupational dose. In any case where an owner is unable to obtain reports of the individual's occupational dose for a previous complete calendar quarter, it shall be assumed that the individual has received the occupational dose specified in whichever of the following columns apply:

	Assumed exposure in Parts of body rem quarters prior to Jan. 1, 1961	Assumed exposure in rem quarters beginning on or after Jan. 1, 1961
Whole body, gonads, active blood-forming organs, head and trunk, lens of eye	3 ³ / ₄	1 ¹ / ₄

3. If calculation of the individual's accumulated occupational dose for all periods prior to January 1, 1961, yields a result higher than the applicable accumulated dose value for the individual as of that date, as specified in subsection (b) of this Section, the excess may be disregarded. The owner shall retain and preserve records used in preparing Form BRP-27, or its equivalent, as specified in subsection (b)3 of this Section.
- (d) For individuals within a controlled area, the radiation dose to tissues of the body from radioactive materials within the body shall be controlled by limiting the average rates at which such materials are taken into the body. Where the intake results from the occurrence of radioactive materials in the air, the concentration of the radioisotopes in the air, averaged over any seven consecutive days, shall not be permitted to exceed the concentrations listed in Section 6.5(a) (Average

concentrations) of this Chapter, Column B, or prorated values if more than one isotope is present. The limits given in Section 6.5(a) of this Chapter, Column B, are based upon exposure to the concentrations specified for 40 hours in any period of seven consecutive days. In any such period where the number of hours of exposure is less than 40, the limits specified in the table may be increased proportionately. In any such period, where the number of hours of exposure is greater than 40, the limits specified in the table shall be decreased proportionately.

- (e) Except as authorized by the Department in writing, no allowance shall be made in subsection (d) of this Section or the use of protective clothing or equipment, or particle size.
 - 1. The Department may authorize an owner to expose an individual in a controlled area to airborne concentrations in excess of the limits specified in Section 6.5(a) of this Chapter, Column B, upon receipt of an application demonstrating that the concentration is composed in whole or in part of particles of such size that such particles are not respirable and that the individual will not inhale concentrations in excess of the limits established in Section 6.5(a) of this Chapter, Column B. Each application under this paragraph shall include an analysis of particle size in the concentrations and a description of the methods used in determining the particle size.
 - 2. The Department may authorize an owner to expose an individual in a controlled area to airborne concentrations in excess of the limits specified in Section 6.5(a) of this Chapter, Column B, upon receipt of an application demonstrating that the individual will wear appropriate protective equipment and that the individual will not inhale, ingest, or absorb quantities of radioactive material in excess of those which might otherwise be permitted under this Chapter for individuals in controlled areas during a 40-hour week. Each application under this paragraph shall contain the following information:
 - i. A description of the protective equipment to be employed, including the efficiency of the equipment for the material involved;
 - ii. Procedures for the fitting, maintenance, and cleaning of the protective equipment;
 - iii. Procedures governing the use of the protective equipment, including supervisory procedures and length of time the equipment will be used by the individuals in each workweek. The proposed periods for use of the equipment by an individual shall not be of such duration as would discourage observance by the individual of the proposed procedures; and
 - iv. The average concentrations present in the areas occupied by the individuals.

- (f) The dose received by any individual under 18 years of age shall not exceed ten per cent of the limits established in subsection (a) of this Section nor shall such an individual be exposed to concentrations of radioactive material greater than those listed in Section 6.5(a) of this Chapter, Column D. For purposes of this subsection, concentrations may be averaged over periods not greater than one week.

7:28-6.2 Radiation levels outside controlled areas

- (a) The radiation level at any point outside the confines of the controlled area shall be limited to a value such that there is no reasonable possibility that any individual outside the controlled area will receive a radiation dose to the whole body, head and trunk, active blood-forming organs, gonads, or lens of the eyes, in excess of 0.5 rem in any one year.
- (b) The radiation level at any point outside the confines of a controlled area shall not exceed:
 - 1. A radiation level which, if an individual were continuously present in the area, could result in his receiving a dose in excess of two millirems in any one hour; or
 - 2. A radiation level which, if an individual were continuously present in the area, could result in his receiving a dose in excess of 100 millirems in any seven consecutive days.
- (c) Any person may apply to the Department for proposed limits upon levels of radiation outside of controlled areas in excess of those specified in subsection (b) of this Section resulting from the applicant's possession or use of sources of radiation. Such applications shall include information as to anticipated average radiation levels and anticipated occupancy times for each area involved. The Department will approve the proposed limits if the applicant demonstrates to the satisfaction of the Department that the proposed limits are not likely to cause any individual to receive a dose to the whole body in any period of one calendar year in excess of 0.5 rem.
- (d) The limitations of this Section shall not be applicable to outgoing or incoming shipments of radioactive materials while being transported in conformance with the regulations of Subchapter 14 (Therapeutic Installations).

7:28-6.3 Concentrations in effluents from controlled areas

Concentrations of radioactive materials in effluents from controlled areas shall meet the requirements of Sections 11.2 (Disposal by release into sanitary sewerage systems) and 11.3 (Disposal by discharges into the air, ground waters or surface waters) of this Chapter.

7:28-6.4 Exposures in the event of radiation incidents or emergencies

In the event of a radiation incident in which an employee or emergency worker receives more than the limits specified in Section 6.1(a) (Exposure of individuals in controlled areas) of this Chapter or in the event of emergency conditions in which immediate action required to minimize danger to life results in an employee or emergency worker receiving doses beyond the limits specified in Section 6.1(a) (Exposure of individuals in controlled areas) of this Chapter. Each employer shall take measures to limit additional exposures of his employees to an extent and for a period, which shall be subject to approval by the Department. All such doses shall be reported as required by Subchapter 13 (Reports of Thefts and Radiation Incidents) of this Chapter and shall be included in the records required by Subchapter 8 (Records) of this Chapter.

7:28-6.5 Average concentrations

- (a) Maximum permissible average concentrations of radioactive materials in air and water shall be as follows:

*****TABLE OF MAXIMUM PERMISSIBLE*****

*****CONCENTRATIONS OMITTED*****

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- (b) In any case where there is a mixture in air or water of more than one radionuclide, the limiting values for purposes of this Section shall be determined as follows:

1. If the identity and concentration of each radionuclide in the mixture are known, the limiting values shall be derived as follows:
 - i. Determine, for each radionuclide in the mixture, the ratio between the quantity present in the mixture and the limit otherwise established in this Section for the specific radionuclide when not in a mixture.
 - ii. The sum of such ratios for all the radionuclides in the mixture may not exceed "1" ("unity").
 - iii. For example, if radionuclides A, B, and C are present in concentrations, Ca, Cb, and Cc, and if applicable MPCs and MPCa and MPCb and MPCc respectively, then the concentrations shall be limited so that the following relationship exists:

*****FORMULA OMITTED*****

2. If either the identity or the concentration of any radionuclide in the mixture is not known, the limiting values for purposes of this section are:
 - i. For purposes of Column A-- 3×10^{-7}
 - ii. For purposes of Column B-- 1×10^{-12}
 - iii. For purposes of Column C-- 1×10^{-8}
 - iv. For purposes of Column D-- 4×10^{-14}

3. If any of the conditions specified in this paragraph are met, the corresponding values specified in this paragraph may be used in lieu of those specified in paragraph 2 of this subsection.
 - i. If the identity of each radionuclide in the mixture is known but the concentration of one or more of the radionuclides in the mixture is not known, the concentration limit for the mixture is the limit specified in subsection (a) of this Section for the radionuclide in the mixture having the lowest concentration limit;
 - ii. If the identity of each radionuclide in the mixture is not known, but it is known that certain radionuclides specified in subsection (a) of this Section are not present in the mixture, the concentration limit for the mixture is the lowest concentration limit specified in subsection (a) of this Section of any radionuclide which is not known to be absent from the mixture; or
 - iii. *****TABLE OMITTED*****
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4. If the mixture of radionuclides consists of uranium and its daughter products in ore dust prior to chemical processing of the uranium ore, the values specified in this paragraph may be used in lieu of those determined in accordance with paragraph 1 of this subsection, or those specified in paragraphs 2 and 3 of this subsection.
 - i. For purposes of subsection (a) of this Section, Column B, 1×10^{-10} uc/ml gross alpha activity; or 2.5×10^{-11} uc/ml natural uranium; or 75 micrograms per cubic meter of air natural uranium.
 - ii. For purposes of subsection (a) of this Section, Column C, 3×10^{-13} uc/ml gross alpha activity; or 8×10^{-13} uc/ml natural uranium; or 3 micrograms per cubic meter of air natural uranium.
5. For purposes of this subsection, a radionuclide may be considered as not present in a mixture if:
 - i. The ratio of the concentration of that radionuclide in the mixture (Ca) to the concentration limit for the radionuclide specified in Columns C and D of subsection (a) of this Section, (MPCa) does not exceed $1/10$, that is

*****FORMULA OMITTED*****
 - ii. The sum of such ratios for all the radionuclides considered as not present in the mixture does not exceed $1/4$; that is

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